NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

TROPICAL STORM MINDY

(AL132021)

8–9 September 2021

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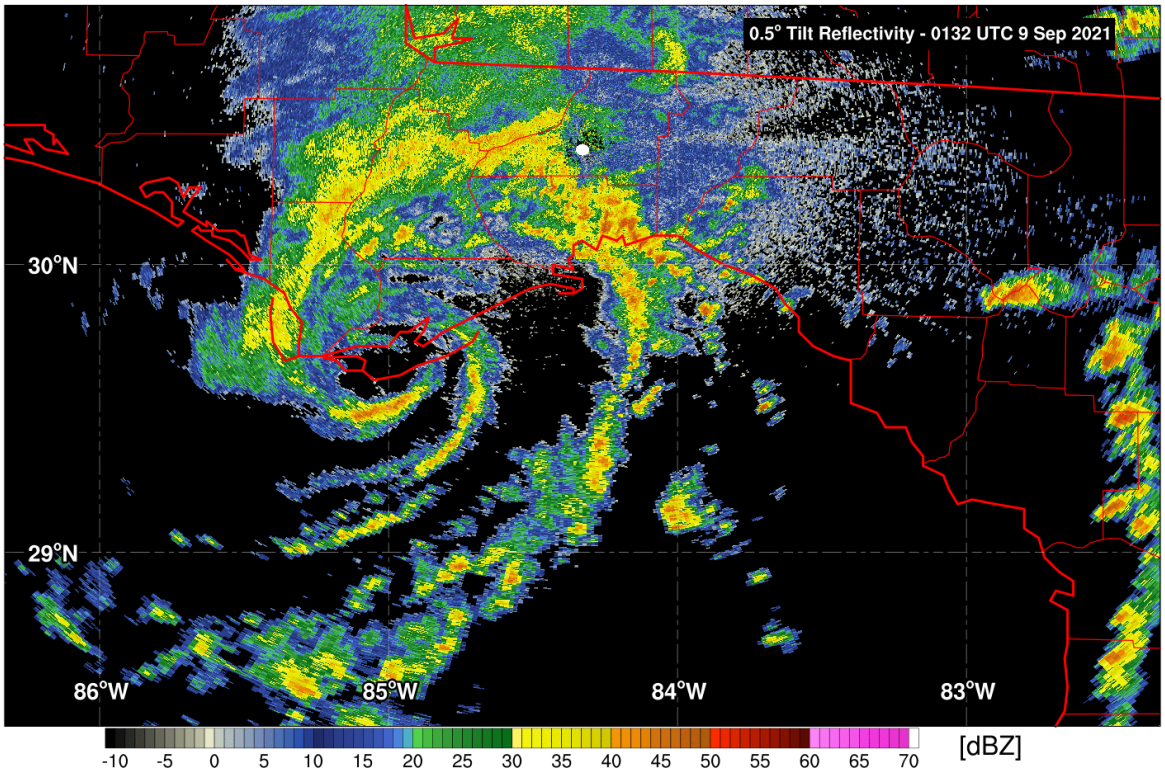

WSR-88D RADAR REFLECTIVITY IMAGERY FROM TALLAHASSEE, FL (KTLH) VALID AT 0132 UTC 9 SEPTEMBER 2021, SHOWING TROPICAL STORM MINDY NEAR LANDFALL. DATA USED TO CREATE THIS RADAR IMAGE COURTESY OF THE NOAA BIG DATA PROJECT.

Mindy was a short-lived tropical storm that made landfall along the coast of the Florida Panhandle near St. Vincent Island, early on 9 September. The storm moved quickly across the southeastern United States before emerging over the Atlantic Ocean where it subsequently became a post-tropical cyclone when it merged with a frontal zone.

Tropical Storm Mindy

8–9 SEPTEMBER 2021

SYNOPTIC HISTORY

The origins of Mindy can be traced back to a tropical wave that emerged off the coast of Africa on 22 August. Over the following days, this wave, accompanied by a broad area of low pressure, moved westward across the Atlantic basin as it was steered by a broad subtropical ridge to its north. On 27 August, this wave fractured for the first time, and the northern portion of the wave would go on to become Tropical Storm Kate[1] over the central tropical Atlantic on 28 August. The southern portion of this wave continued westward, crossing the Windward Islands on 28–29 August. The wave briefly showed some signs of organization on 1 September while over southern Caribbean, but this feature moved quickly inland over Central America by 2 September without further development. At this point, the wave axis split once again, with the southern part moving onward into the eastern Pacific. This wave portion would ultimately help spawn Hurricane Olaf in the eastern Pacific on 7 September[2]. The northern portion of the wave moved slowly northwestward across the Yucatan Peninsula on 3–4 September, producing disorganized convection and heavy rainfall across Mexico. This feature finally emerged over the Gulf of Mexico on 5 September with disorganized convection continuing along the eastern flank of the trough axis. Over the next several days, this system moved very slowly northward, caught in an area of light steering flow between two competing mid-level ridges to its northwest (over the southern U.S. Gulf coast) and southeast (over the northwest Caribbean). Finally, on 8 September, a deep-layer trough moved into the western Gulf of Mexico, which helped to accelerate the system northeastward towards the northern Gulf coast. Before sunrise, a nocturnal burst of deep convection helped the system become better defined at the surface, and scatterometer data at 1516 UTC that day suggested a well-defined center was developing with winds around 35 kt. Mindy is estimated to have formed as a 35-kt tropical storm by 1800 UTC 8 September about 140 n mi southwest of Apalachicola, Florida. The “best track” chart of Mindy’s path is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1[3].

During the afternoon and evening of 8 September, Mindy intensified in an environment of warm sea surface temperatures near 29°C, moderate southwesterly vertical wind shear between 15–20 kt, and marginal mid-level relative humidity around 60%. However, the storm also continued to accelerate toward the northeast, limiting its remaining time over the Gulf of Mexico. Surface observations and doppler radar data and indicated that Mindy reached a peak intensity

[1] Tropical Storm Kate’s report is available at https://www.nhc.noaa.gov/data/tcr/AL102021_Kate.pdf
[2] Hurricane Olaf’s report is available at https://www.nhc.noaa.gov/data/tcr/EP152021_Olaf.pdf
[3] A digital record of the complete best track, including wind radii, can be found on line at ftp://ftp.nhc.noaa.gov/atcf. Data for the current year’s storms are located in the *btk* directory, while previous years’ data are located in the *archive* directory.

near 50 kt as the center made landfall at 0115 UTC 9 September on St. Vincent Island, Florida, about 10 n mi west-southwest of Apalachicola, Florida. While Mindy produced only a limited area of deep convection on infrared satellite imgery, radar reflectivity and velocity data at landfall showed a well-organized low-level circulation with spiral banding (cover photo). The storm then skirted the Florida coast near the Big Bend region over the next several hours, with the center passing just south of Tallahassee. Mindy weakened into a tropical depression by 1200 UTC 9 September as it continued to move quickly northeastward across northern Florida and far southeast Georgia. By 1800 UTC that day, the depression had already moved back offshore over the western Atlantic Ocean. However, increasing westerly vertical wind shear and a cold front that had also recently moved offshore of the southeastern United States caused Mindy to begin losing tropical cyclone characteristics as the remaining convection became increasingly disorganized. Mindy is estimated to have become a post-tropical low by 0000 UTC 10 September about 150 n mi southeast of Wilmington, North Carolina, and its circulation was tracked for another day before it fully merged with the baroclinic zone at 0000 UTC 11 September.

METEOROLOGICAL STATISTICS

Observations in Mindy (Figs. 2 and 3) include subjective satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB), objective Advanced Dvorak Technique (ADT) estimates and Satellite Consensus (SATCON) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Global Precipitation Mission (GPM), the European Space Agency's Advanced Scatterometer (ASCAT), and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Mindy, along with WSR-88D radar data from coastal NWS Weather Forecast Offices (WFOs).

Selected surface observations from land stations and data buoys are provided in Table 2.

Winds and Pressure

Mindy's estimated peak intensity of 50 kt at 0115 UTC 9 September is based primarily on surface observations and Doppler radar data occurring near the time of landfall. A WeatherSTEM site at Island View Park, Florida (FSWNIVP) reported a 1-min sustained wind of 47 kt at 0224 UTC 9 September (Fig. 4, top panel). A street view of the station just off Highway 98 (Fig. 4, bottom panel) illustrates that its elevation was near 15 ft (5 m), lower than the standard 30 ft (10 m) used to assess peak sustained winds. Using the Power Law Method[4], the sustained winds can be adjusted to an estimated 50.7 kt at a 10-m elevation, which is the basis for Mindy's peak

[4] More information on the Power Law Method can be found from the following citation: Hsu, S. A., Meindl, E. A., & Gilhousen, D. B., 1994: Determining the Power-Law Wind-Profile Exponent under Near-Neutral Stability Conditions at Sea, *J. Appl. Meteor. Climatol.*, ***33*(6)**, 757-765.

intensity of 50 kt at landfall. Another exposed WeatherSTEM site at St. George Island Bridge (SGIBR) reported a 9-m sustained wind of 46 kt gusting to 50 kt at 0122 UTC 9 September. A WeatherFlow station (XAPA) at Apalachee Bay also reported an 8-m sustained wind of 43 kt at 0343 UTC 9 September.

In addition to surface observations, Doppler radar-derived velocities from the Tallahassee, Florida, WSR-88D radar (KTLH) generally support an intensity between 45–50 kt. From 0100–0230 UTC 9 September, there were several >10-min periods where peak 4-bin averaged velocities exceeded 60 kt at heights between 4500–5500 ft above sea level (Fig. 5). These radar-derived winds reduce to a surface wind speed between 45–50 kt using either a conservative (75%) or standard (80%) reduction factor. While inner-core convection around Mindy was somewhat weaker than typically seen in more mature tropical cyclones (see cover photo), surface observations support the higher end estimates of the radar-derived velocity data near 50 kt.

Mindy's lowest estimated minimum pressure of 1000 mb also occurred around the time of landfall along the Florida Panhandle coast. This minimum pressure is based on a WeatherSTEM site at the Franklin County Emergency Operation Center that reported a minimum pressure of 1000.4 mb at 0129 UTC 9 September as sustained winds dropped below 10 kt. Additional stations at Saint George Island Bridge and Island View Park also measured 1002.3 and 1003.4 mb, respectively, around 0200 UTC 9 September but with winds in the 20–30 kt range.

There were no ship reports of winds of tropical storm force in association with Mindy.

Storm Surge[5]

Mindy produced minor storm surge inundation levels of 1 to 2 ft above normally dry ground (AGL) along portions of the Florida Big Bend and Apalachee Bay coasts. The peak measured storm surge was 1.58 ft above normal tide levels at the National Ocean Service (NOS) tide gauge at Cedar Key, Florida, which resulted in a peak water level of 1.7 ft above Mean Higher High Water (MHHW) at that site. Slightly higher water levels were measured by a Suwanee River Water Management District gauge at Steinhatchee (2.3 ft MHHW), a United States Geological Survey (USGS) stream gauge at the mouth of the Suwanee River (2.1 ft MHHW), and a University of South Florida Coastal Ocean Monitoring and Prediction System (COMPS) site at Shell Point (2.1 ft MHHW). Slightly higher water levels may have occurred at isolated locations between these gauges. Table 2 and Figure 6 provide observations from various tide stations and water level sensors along the coast of Apalachee Bay, Florida.

[5] Several terms are used to describe water levels due to a storm. **Storm surge** is defined as the abnormal rise of water generated by a storm, over and above the predicted astronomical tide, and is expressed in terms of height above normal tide levels. Because storm surge represents the deviation from normal water levels, it is not referenced to a vertical datum. **Storm tide** is defined as the water level due to the combination of storm surge and the astronomical tide, and is expressed in terms of height above a vertical datum, i.e. the North American Vertical Datum of 1988 (NAVD88). **Inundation** is the total water level that occurs on normally dry ground as a result of the storm tide, and is expressed in terms of height above ground level. At the coast, normally dry land is roughly defined as areas higher than the normal high tide line, or Mean Higher High Water (MHHW).

Rainfall and Flooding

Mindy produced relatively modest rainfall for a tropical cyclone, due to its fast forward motion and relatively small size. Table 2 provides selected rainfall totals associated with Mindy in the United States, while Figure 7 provides a spatial analysis of rainfall totals over the southeastern United States from 7–9 September. Heavy rainfall in northern Florida and southeast Georgia (3–5 inches) occurred in a strip from the Florida Panhandle near Panama City and stretching northeastward to the I-75 corridor near Tifton, Georgia. The highest precipitation total in this region was 4.85 inches at the Tallahassee Forestry Service. A more localized area of higher rainfall totals was observed in the upper Florida Peninsula associated with Mindy's outer rain bands. The peak total in this region was observed in Beverly Hills, Florida at 5.60 inches. A larger region of 4–6-inch totals was observed along coastal South Carolina southeast of I-95 from Beaufort to Charleston, where the peak total was 5.68 inches near Beaufort.

Tornadoes

There was one brief EF0 tornado observed with Mindy that occurred in the forested area of rural Wakulla county Florida late on 8 September. Only minor tree damage was reported.

CASUALTY AND DAMAGE STATISTICS

Relatively minor impacts were associated with Tropical Storm Mindy as it moved quickly across the northern Florida and southern Georgia before emerging off into the Atlantic Ocean. The most significant damage was related to wind-downed trees which resulted in scattered power outages. Overall, about 10,000 customers lost power across the central Florida Panhandle with a couple thousand additional sporadic outages in southeastern Georgia. In Leon County, Florida, two homes were damaged by fallen trees and one mobile home destroyed with a person briefly trapped inside, though no injury resulted. Additional fallen trees were reported in Jefferson, Holmes, Lowndes, Grady, and Wakulla Counties in Florida. Several roadways in the Tallahassee metro area were closed early on 9 September due to downed trees related to Mindy. One truck was also overturned on I-10 eastbound near Tallahassee due to strong winds associated with the storm. No casualties[6] were reported in association with Mindy in the United States.

When Mindy's precursor system moved slowly across the Yucatan Peninsula of Mexico, widespread flooding was reported. This heavy rainfall and flooding resulted in 23 fatalities and more than $75 million (USD) of estimated economic loses according to the Aon Insurance September 2021 catastrophe report.

[6] Deaths occurring as a direct result of the forces of the tropical cyclone are referred to as "direct" deaths. These would include those persons who drowned in storm surge, rough seas, rip currents, and freshwater floods. Direct deaths also include casualties resulting from lightning and wind-related events (e.g., collapsing structures). Deaths occurring from such factors as heart attacks, house fires, electrocutions from downed power lines, vehicle accidents on wet roads, etc., are considered indirect" deaths.

FORECAST AND WARNING CRITIQUE

The genesis of Mindy was not well forecast, primarily due to uncertainty in pinpointing the location and timing of genesis that ultimately occurred in the northeastern Gulf of Mexico. Table 3 provides the number of hours in advance of formation with the first NHC Tropical Weather Outlook forecast in each likelihood category. A low (<40%) chance of genesis in the western Caribbean Sea was introduced at 0600 UTC 30 August, 228 h (9.5 days) before development occurred. The 2-day probabilities were introduced 180 h before development. These low 2- and 5-day outlook areas initially suggested genesis was possible in the Caribbean Sea early in the system's evolution (Fig. 8); however, the disturbance moved inland over Central America before additional development took place. Thereafter, low 5-day probabilities were maintained, while all 2-day probabilities were dropped as the system crossed Central America and eventually emerged into the Gulf of Mexico on 5 September. Two-day low probabilities were reintroduced 36 h before genesis at 0600 UTC 7 September and both the 5-day and 2-day probabilities were then raised to the medium (40–60%) category 24 h and 18 h before Mindy developed, respectively. However, uncertainty remained if the system would develop into a tropical cyclone before moving inland along the Florida Panhandle. While a high probability (>60%) Special Tropical Weather Outlook was issued at 1920 UTC 8 September (Fig. 8d), the final best track indicates that Mindy was already a 35-kt tropical storm by 1800 UTC that day. The large number of low 5-day outlook areas generated while the pre-Mindy system was over the Caribbean and Central America resulted in a relatively poor 50% overall hit rate[7] for all outlook areas (Fig. 8a–b). However, once probabilities were raised to the medium category, the location of genesis in the northern Gulf of Mexico was correctly highlighted (Fig. 8c).

A verification of NHC official track and intensity forecasts for Mindy is given in Tables 4 and 5, respectively. Official track forecast errors were comparable to the mean official errors for the previous 5-yr period, and intensity forecast errors were lower than the mean official errors, albeit for a small sample size of only three verifying 12-h forecasts and one 24-h forecast. Due to Mindy's brief existence as a tropical storm, no meaningful comparisons can be made with the model guidance.

Coastal watches and warnings associated with Mindy are given in Table 6. Given the uncertainty in Mindy's prospects to become a tropical cyclone as discussed above, Potential Tropical Cyclone advisories were not issued for this system. Mindy's genesis occurred only a bit more than 6 h before landfall and resulted in Tropical Storm Warnings being issued for the Florida Panhandle coastline only several hours before tropical storm impacts were felt, resulting in a much shorter-than-normal lead time. Due to the expected minor degree of coastal storm surge inundation for Mindy, storm surge watches and warnings were not issued.

[7] The fraction of outlooks where the tropical cyclone genesis location was captured within the TWO genesis area.

IMPACT-BASED DECISION SUPPORT SURVICES (IDSS) AND PUBLIC COMMUNICATION

The Tropical Analysis and Forecast Branch of NHC provided one live briefing to the U.S. Coast Guard (USCG) District 8 in New Orleans for Tropical Storm Mindy on 9 September in support of the USCG's life-saving mission. Key messages on Mindy were included in NHC Tropical Cyclone Discussions, in graphical format on the NHC webpage, and through social media posts from 8–9 September.

ACKNOWLEDGMENTS

Data in Table 2 were compiled from Post Tropical Cyclone Reports and Public Information Statements issued by NWS Forecast Offices (WFOs) in addition to reports from the Weather Prediction Center, National Data Buoy Center, and NOS Center for Operational Oceanographic Products and Services. Special thanks to Senior Hurricane Specialist John Cangialosi for the Mindy "best track" map (Fig. 1).

Table 1. Best track for Tropical Storm Mindy, September 8–9, 2021.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
08 / 1800	28.4	86.8	1006	35	tropical storm
09 / 0000	29.5	85.4	1001	45	"
09 / 0115	29.7	85.1	1000	50	"
09 / 0600	30.5	83.9	1001	35	"
09 / 1200	31.2	81.8	1005	30	tropical depression
09 / 1800	31.7	79.4	1005	30	"
10 / 0000	32.1	76.8	1005	30	low
10 / 0600	32.6	74.0	1005	30	"
10 / 1200	33.2	71.8	1005	30	"
10 / 1800	33.7	69.8	1006	30	"
11 / 0000					dissipated
09 / 0115	29.7	85.1	1000	50	Maximum winds and minimum pressure and landfall in St. Vincent, Florida

Table 2. Selected surface observations for Tropical Storm Mindy, 8–9 September 2021.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Florida									
International Civil Aviation Organization (ICAO) Sites									
Tallahassee Regional Airport (KTLH) (30.40N 84.35W)	09/0428	1004.4	09/0451	26	35				3.38
Apalachicola Municipal Airport (KAAF) (29.73N 85.02W)	09/0143	1002.0	09/0215	26	36				2.31
National Ocean Service (NOS) Sites									
Cedar Key (CKYF1) (29.13N 83.03W)						1.58		1.7	
Apalachicola (APCF1) (29.73N 84.98W)	09/0136	1003	09/0118	31	39	1.45		1.0	
Clearwater Beach (CWBF1) (27.98N 82.83W)						1.09		0.9	
WeatherFlow Sites									
Apalachee Bay (XAPA) (30.00N 84.34W)			09/0343	43 (8 m)	49				
St. George Island (XSTG) (29.67N 84.86W)			09/0131	40 (15 m)	47				
WeatherSTEM Sites									
Saint George Island Bridge (SGIBR) (29.66N 84.88W)	09/0207	1002.3	09/0122	46 (9 m)	50				
Island View Park (FSWNIVP) (29.85N 84.64W)	09/0245	1003.4	09/0224	47 (5 m)	47				
St. Marks Lighthouse (FSWMSML) (30.07N 84.18W)	09/0401	1005.6	09/0413	44 (3 m)	47				
FSU Coastal and Marine Lab (FSUCML) (29.92N 84.51W)	09/0307	1003.9	09/0334	40	43				
Florida A&M University (FAMU) (30.43N 84.29W)	09/0448	1004.1	09/0501	29	39				
Franklin County EOC (FSWNFCEOC) (29.72N 85.03W)	09/0129	1000.4	09/0114	32 (23 m)	36				

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Horseshoe Beach (FSWNHORSESHOEBCH) (29.44N 84.25W)	09/0711	1010.6	09/0621	30 (7 m)	36				
Ochlockonee Boat Ramp (FSWNOBR) (29.96N 84.38W)	09/0331	1006.7	09/0311	36 (5 m)	41				
Aucilla Christian Academy (ACA) (30.48N 83.76W)	09/0624	1001.1	09/0601	17	29				
Coastal Marine Automated Network (C-MAN) Sites									
Tyndall AFB Tower C (SGOF1) (29.41N 84.86W)	09/0100	1007.1	09/0130	43 (35 m)	53				
Keaton Beach (KTNF1) (29.82N 83.59W)	09/0700	1010.0	09/0600	29 (10 m)	38				
USGS Stream Gauges									
Suwannee River (SUWF1) (29.34N 83.09W)								2.1	
Spring Creek (SBIF1) (30.07N 84.33W)							3.40	1.7	
Econfina River (EFSF1) (30.07N 83.90W)							3.58	1.4	
Jackson River near Apalachicola (JRAF1) (29.77N 85.08W)							2.04	1.4	
Fenholloway River near Hampton Springs (FRHF1) (30.01N 83.78W)							3.06	1.2	
Aucilla River at Nutall Rise (NUTF1) (30.11N 83.98W)								1.1	
Suwannee River Water Management District Gauges									
Steinhatchee (STIF1) (29.67N 83.38W)							3.95	2.3	
University of South Florida Coastal Ocean Monitoring and Prediction System (COMPS) Sites									
Shell Point (SHPF1) (30.06N 84.29W)	09/0406	1005.4	09/0336	37	48			2.1	
Other Sites									
Beverley Hills 1.9 NE (US1FLCT0034) (28.93N 82.44W)									5.60
Hernado 2.9 W (US1FLCT0024) (28.91N 82.42W)									5.30

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Hernado 1.6 N (US1FLCT0011) (28.93N 82.37W)									4.89
Tallahassee (Forestry Service) (TALF1) (30.42N 84.23W)									4.85
Macon Community Par 2 E (30.49N 84.25W)									4.79
Winter Springs 2.3 E (US1FLSM0030) (28.68N 81.24W)									4.75
Tallahassee 9.6 N (US1FLLN0034) (30.59N 84.27W)									4.70
Tallahassee 10.8 N (US1FLLN0041) (30.61N 84.26W)									4.53
Midway 6.9 SW (US1FLLN0018) (30.42N 84.54W)									4.45
Waukeenah 3 NW (30.44N 83.99W)									4.45
The Villages 2.7 NNW (US1FLMR0020) (28.97N 82.00W)									4.27
Tallahassee 5.1 NE (US1FLLN0051) (30.51N 84.22W)									4.20
Bloxham 2 SSE (30.36N 84.61W)									4.18
Killearn Lakes 1 WNW (30.59N 84.24W)									4.17
Inglis 0.6 N (US1FLLV0015) (29.04N 82.66W)									4.03
Tallahassee 3.5 N (US1FLLN0025) (30.51N 84.28W)									4.01
Georgia									
Other Sites									
Thomasville 5.1 ESE (US1GATH0004) (30.82N 83.90W)									4.33
Eason 3 WNW (30.82N 83.90W)									4.31

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Thomasville 2.8 E (US1GATH0002) (30.84N 83.93W)									4.05
Pridgen (PRDG1) (31.70N 82.92W)									4.00
South Carolina									
COOP Sites									
Moncks Corner 4 N (385946) (33.24N 79.99W)									4.30
Other Sites									
Beaufort 1.6 SSW (US1SCBF0080) (32.41N 80.70W)									5.68
Kiawah River 3.5 W (US1SCCR0189) (32.62N 80.12W)									5.11
Charleston 4.6 SSE (US1SCCR0013) (32.73N 79.96W)									5.04
Kiawah Island 3.1 WSW (US1SCCR0199) (32.60N 80.11W)									4.94
Kiawah Island 1.0 SW (US1SCCR0154) (32.60N 80.07W)									4.76
Charleston 5.2 ESE (US1SCCR0096) (32.74N 79.92W)									4.75
Okatie 7.2 ENE (US1SCBF0032) (32.34N 80.84W)									4.58
Ridgeville 3.2 WSW (US1SCDC0069) (33.08N 80.36W)									4.46
Beaufort 2.7 E (US1SCBF0091) (32.43N 80.64W)									4.44
Wadmalaw Island 2.3 SSW (US1SCCR0098) (32.63N 80.20W)									4.41
Edisto Island 3.6 E (US1SCCR0115) (32.55N 80.23W)									4.38

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Charleston 5.9 ESE (US1SCCR0114) (32.75N 79.90W)									4.30
Charleston 5.4 SSE (US1SCCR0060) (32.72N 79.95W)									4.29
Okatie 7.6 NE (US1SCBF0036) (32.37N 80.85W)									4.19
Offshore									
Buoys									
115 NM SSE of Pensacola (42039) (28.79N 86.03W)	08/2110	1006.6	08/2109	41 (4 m)	47				

[a] Date/time is for sustained wind when both sustained and gust are listed.
[b] Except as noted, sustained wind averaging periods for C-MAN and land-based reports are 2 min; buoy averaging periods are 8 min.
[c] Storm surge is water height above normal astronomical tide level.
[d] For most locations, storm tide is water height above the North American Vertical Datum of 1988 (NAVD88).
[e] Estimated inundation is the maximum height of water above ground. For NOS tide gauges, the height of the water above Mean Higher High Water (MHHW) is used as a proxy for inundation.

Table 3. Number of hours in advance of formation associated with the first NHC Tropical Weather Outlook forecast in the indicated likelihood category. Note that the timings for the "Low" category do not include forecasts of a 0% chance of genesis.

	Hours Before Genesis	
	48-Hour Outlook	**120-Hour Outlook**
Low (<40%)	180 / 36 (2nd entry)	228
Medium (40%-60%)	18	24
High (>60%)	-	-

Table 4. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Mindy. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	**20.2**	39.0						
OCD5	48.9	72.7						
Forecasts	3	1						
OFCL (2016-20)	23.9	36.3	49.1	63.9	79.0	94.1	128.1	169.7
OCD5 (2016-20)	45.1	97.2	157.2	216.7	271.1	325.4	414.4	490.0

Table 5. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Mindy. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	**1.7**	**0.0**						
OCD5	0.3	0.0						
Forecasts	3	1						
OFCL (2016-20)	5.4	8.0	9.6	10.9	11.5	12.1	13.3	14.5
OCD5 (2016-20)	7.0	11.0	14.3	16.8	18.3	19.7	21.7	23.0

Table 6. Watch and warning summary for Tropical Storm Mindy, 8–9 September 2021.

Date/Time (UTC)	Action	Location
8 / 2100	Tropical Storm Warning issued	Mexico Beach to Steinhatchee River
9 / 0300	Tropical Storm Warning modified to	Indian Pass to Steinhatchee River
9 / 0600	Tropical Storm Warning modified to	Ochlockonee River to Steinhatchee River
9 / 0900	Tropical Storm Warning discontinued	All

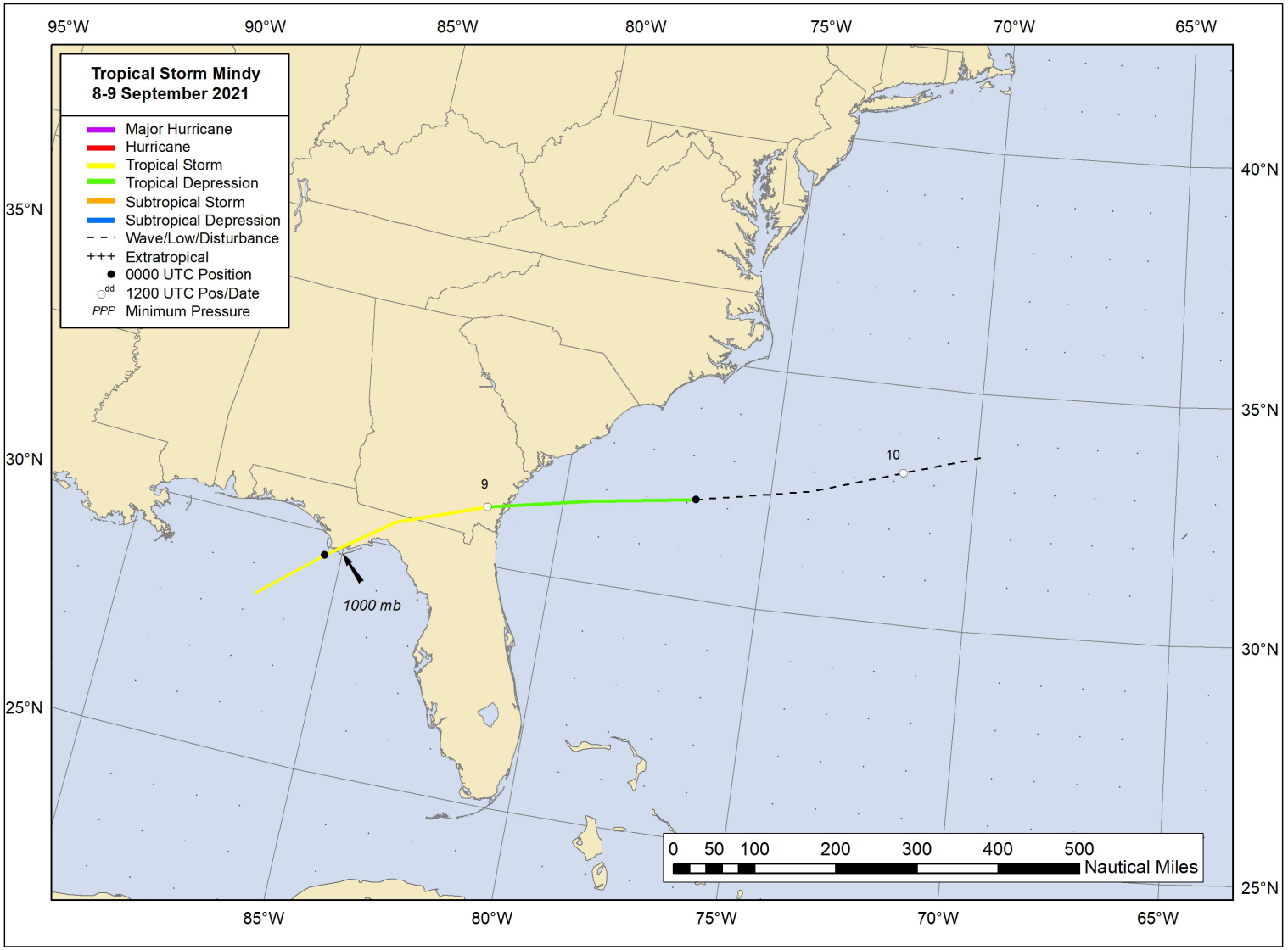

Figure 1. Best track positions for Tropical Storm Mindy, 8–9 September 2021. Tracks during the post-tropical stage are partially based on analyses from the NOAA Weather Prediction Center and the NOAA Ocean Prediction Center.

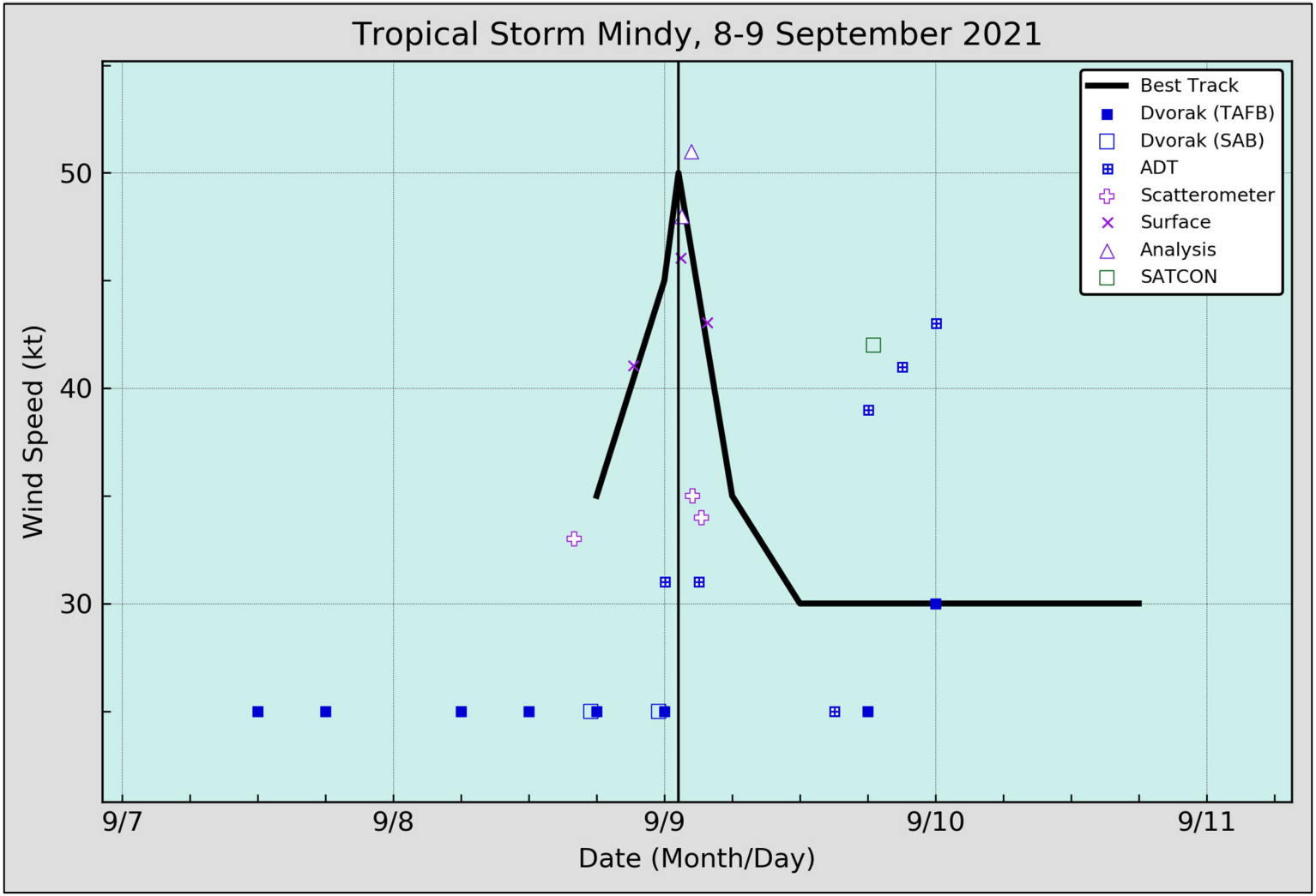

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Mindy, 8–9 September 2021. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC, and the solid vertical line corresponds to landfall.

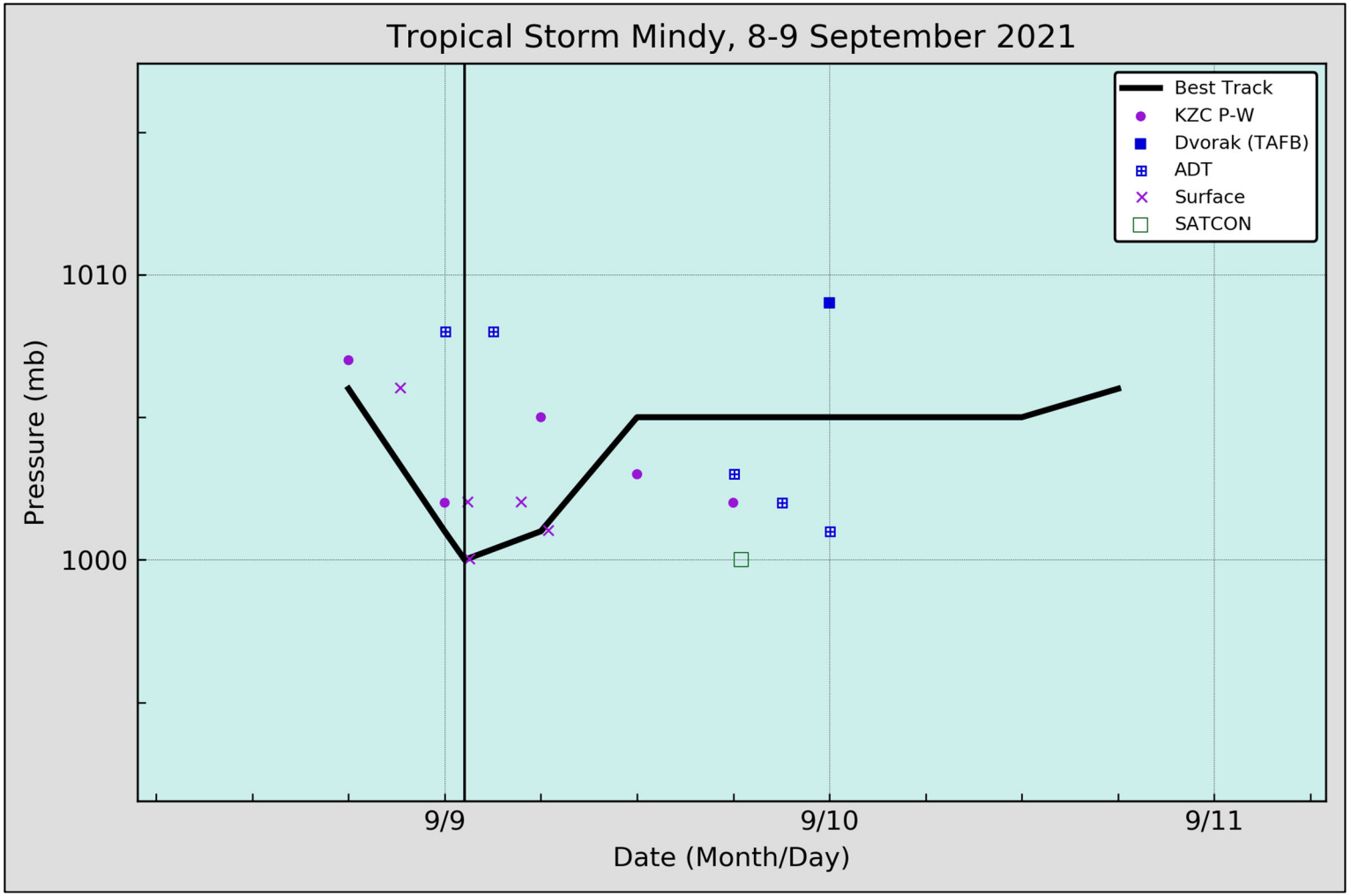

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Mindy, 8–9 September 2021. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC, and the solid vertical line corresponds to landfall.

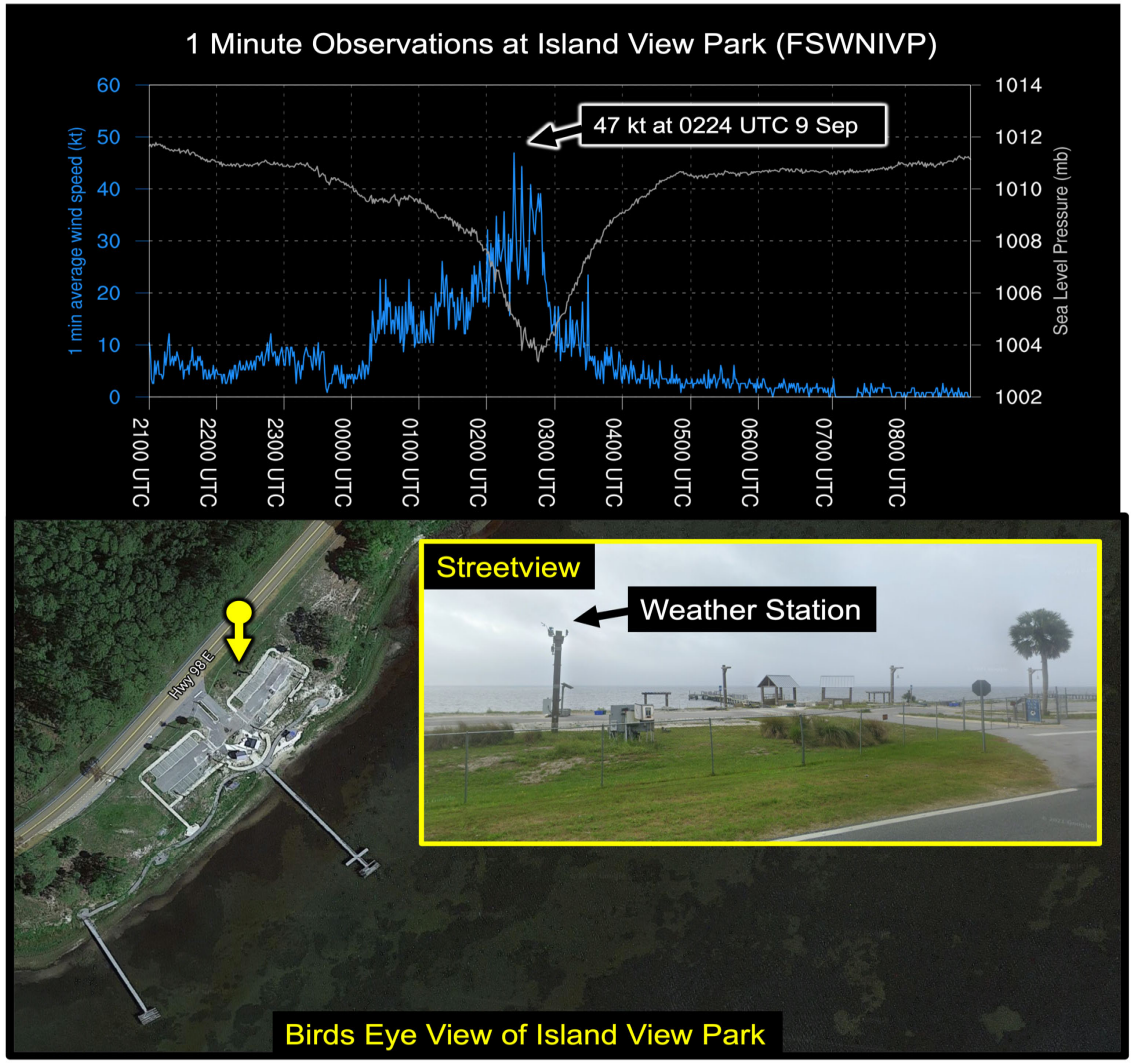

Figure 4. Top panel: 1-minute surface wind observations from Island View Park (FSWNIVP) in Franklin County, Florida from 2100 UTC 8 September to 0900 UTC 9 September 2021. One-minute average wind speed is depicted in blue, while sea level pressure is depicted in gray. Bottom panel: Google map satellite view of Island View Park with yellow arrow pointing to the weather station location. An inset street view from Highway 98 is depicted to highlight the low relative height of the weather station relative to sea level.

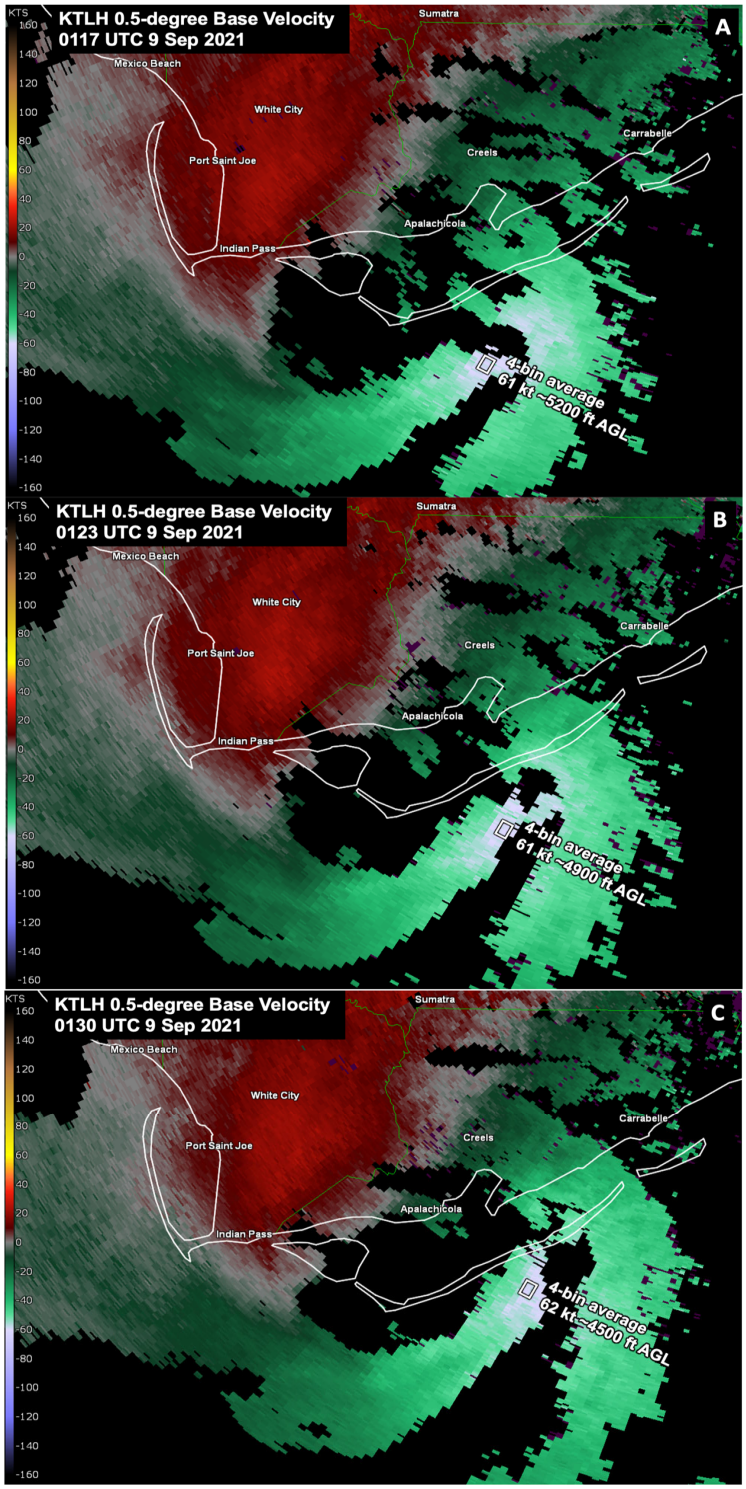

Figure 5. Snapshots of Tallahassee, Florida, WSR-88D (KTLH) radial velocity data at (a) 0117 UTC (b) 0123 UTC, and (c) 0130 UTC on 9 September 2021 as Mindy made landfall. Annotated in each panel is the 4-bin sample average from the radial velocity data (white box with denoted text). Note the continuity and consistent magnitude of the velocity data in the southeast quadrant of the system over the 15-minute period.

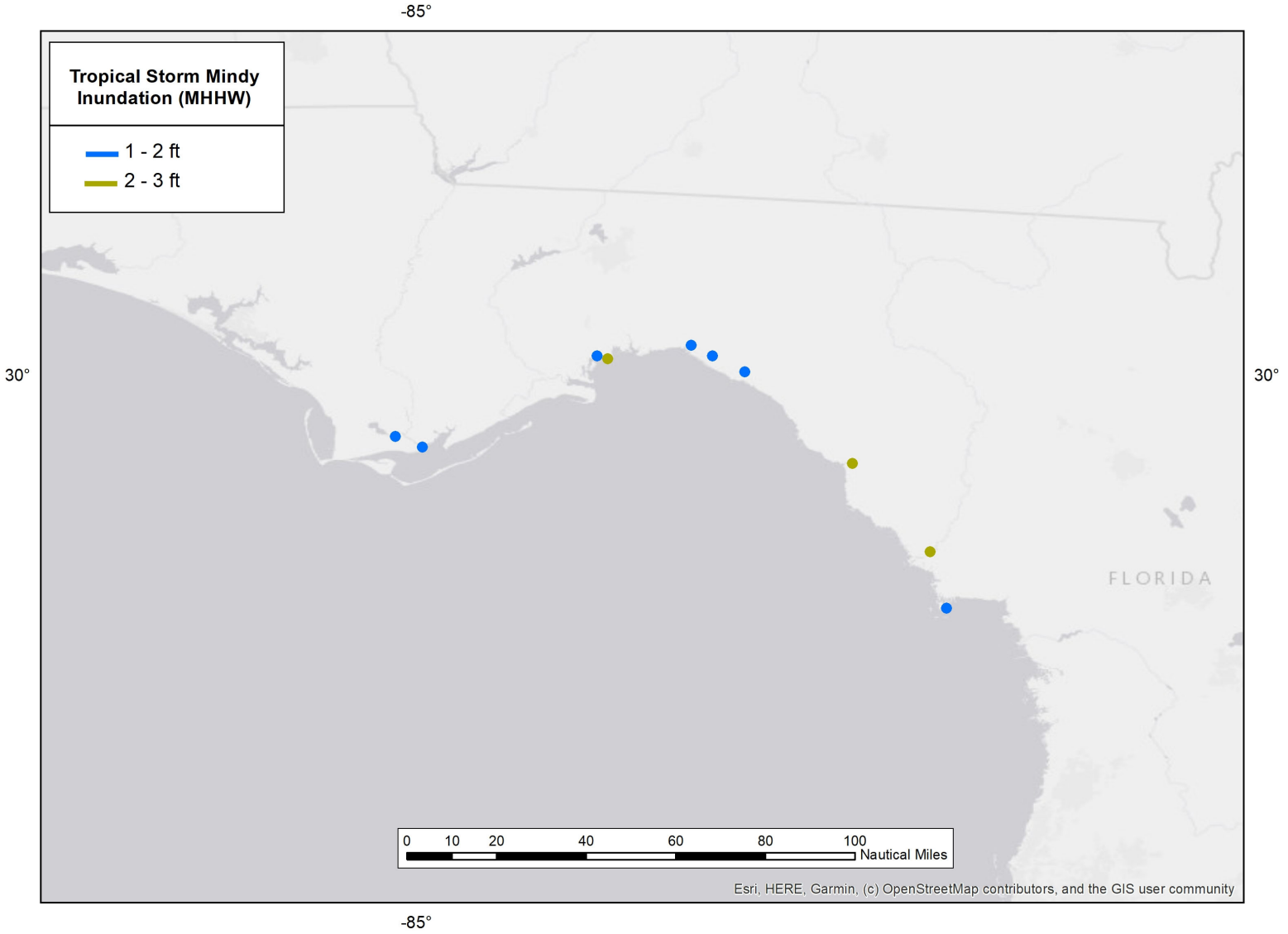

Figure 6. Maximum water levels measured from tide and stream gauges (circles) from Tropical Storm Mindy. Water levels are referenced as feet above Mean Higher High Water (MHHW), which is used as a proxy for inundation (above ground level) on normally dry ground along the immediate coastline.

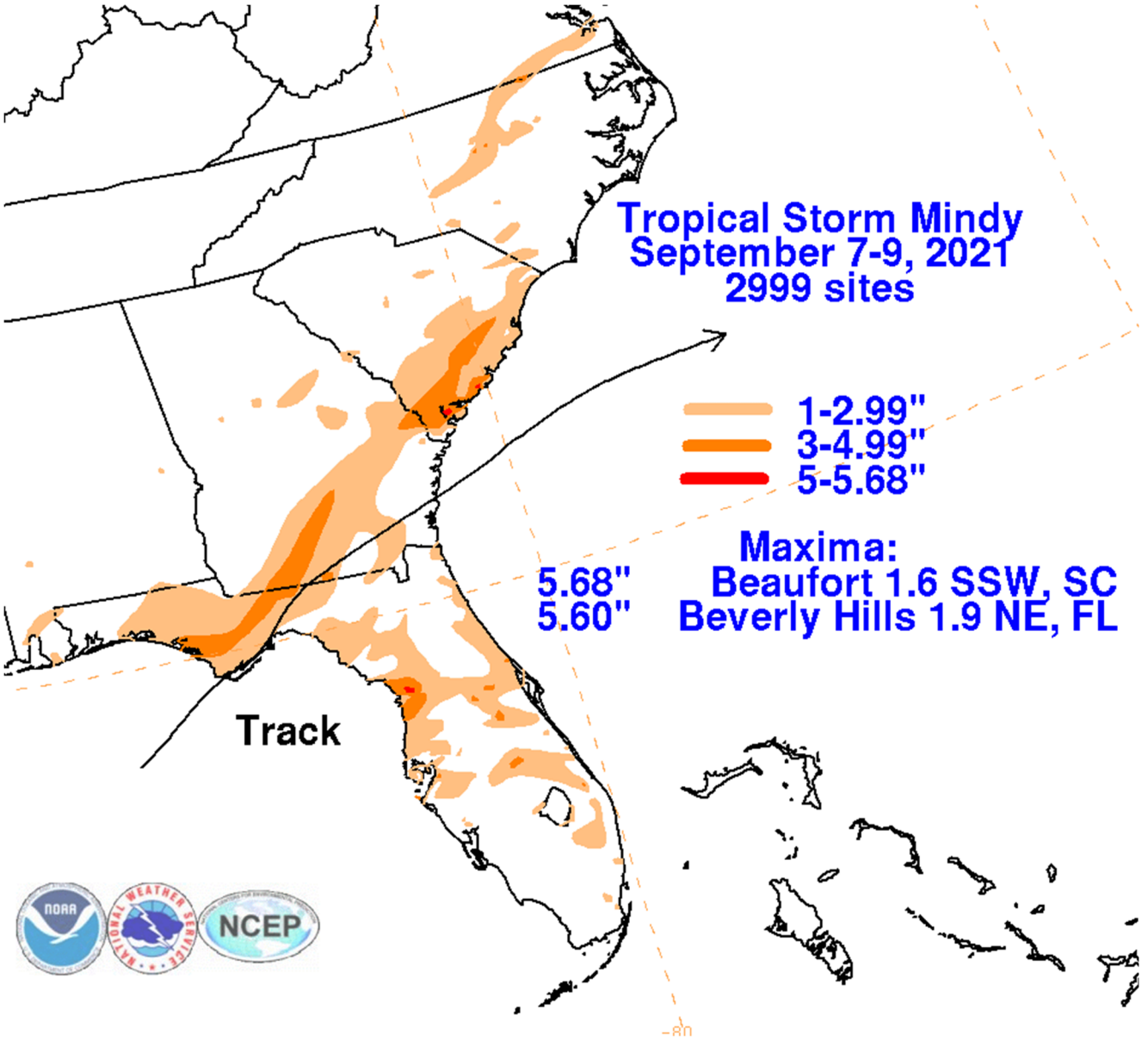

Figure 7. Rainfall accumulations (inches) between 7–9 September 2021 in the United States from Tropical Storm Mindy. Imagery courtesy of David Roth and Zack Taylor from the NOAA Weather Prediction Center.

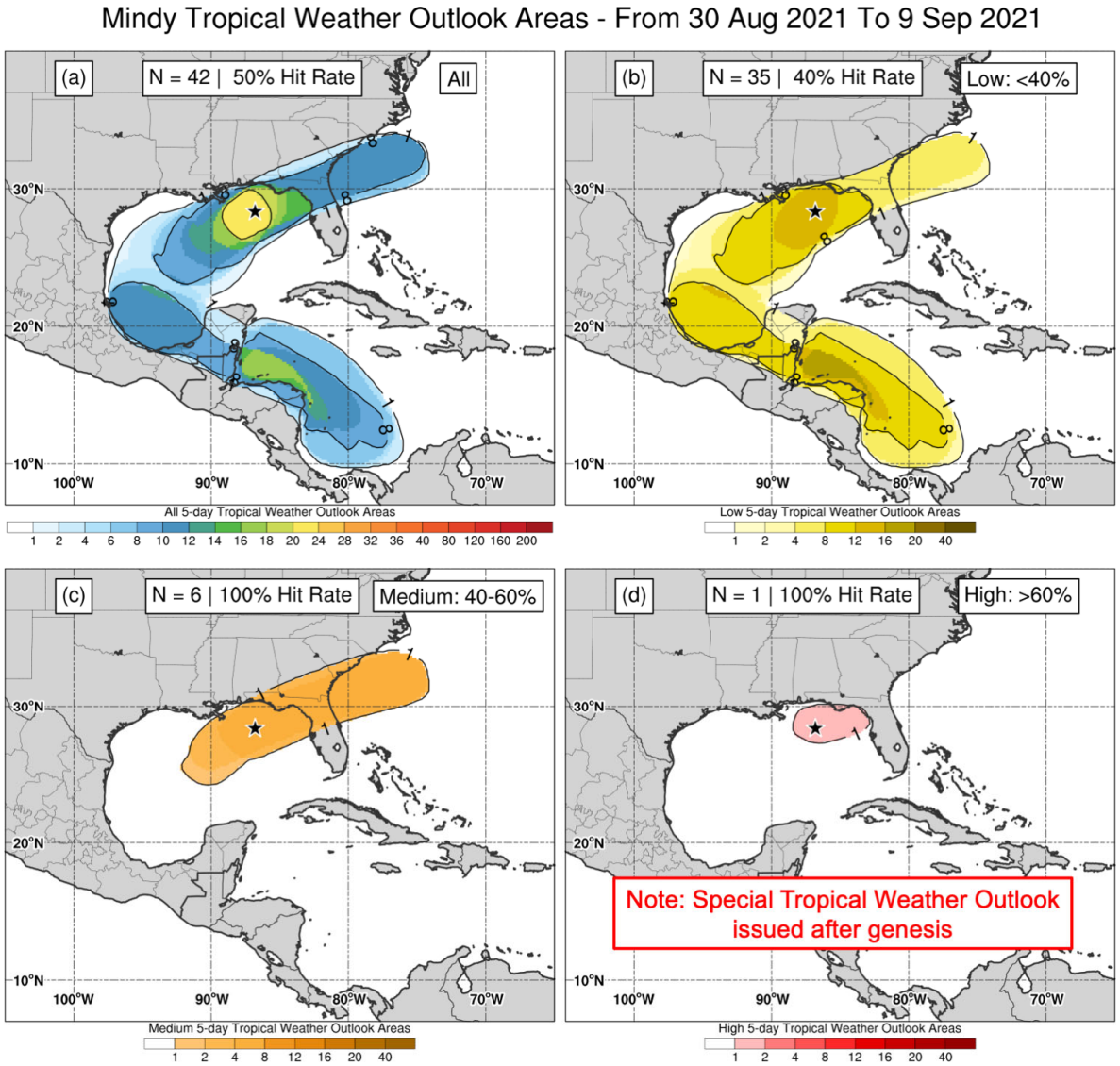

Figure 8. 5-day Tropical Weather Outlook genesis areas associated with the disturbance that developed into Tropical Storm Mindy for (a) all probability areas (10–100%, multi-color shading), (b) low probability areas (< 40%, yellow shading), (c) medium probability areas (40–60%, orange shading), and (d) high probability areas (> 60%, red shading). The black star in each panel indicates the genesis location of Mindy. Hit rate indicates the percentage of outlook areas where the genesis location was captured within.